Risks and complications in surgically assisted rapid maxillary expansion

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ABSTRACT

Rapid maxillary expansion (RME) is generally contra-indicated in patients with incomplete bone formation, and is only used as an alternative in those with advanced skeletal age. In young patients, Haas and Hyrax expanders are indicated and are chosen according to requirements. In adults, an application of orthodontic-surgical techniques allows correction of transversal and other deformities, offering very acceptable and predictable results while increasing the maxillary arch perimeter to correct the posterior crossbite. However, there have been reports of related complications, such as significant hemorrhage, gingival recession, root resorption, devitalization of teeth, sinus infection, oculomotor nerve paralysis, and orbital compartment syndrome. Maxillofacial surgeons should be aware of such possible complications and that patients are fully informed. This study reviews available literature and presents a case of surgical treatment, with the aim of reviewing complications occurring during the orthognathic surgery for opening the midpalatal suture.

Indexing terms: Complications. Orthognathic surgery. Palatal expansion technique.

INTRODUCTION

Rapid maxillary expansion (RME) is often used to improve orthodontic results by increasing the maxillary transverse dimension in young patients¹-⁶. The force exerted by expanders (Haas-type and Hyrax) opens the midpalatal suture⁵-⁶. Such appliances are most commonly used in children, but fail in teenagers and adults, thus RME is less effective in those ages²,⁴,⁶.

Some studies have reported the risks and effects of RME in periodontal, skeletal, dental, ducts, orbital and nasal changes in patients after this orthognathic surgery¹-²,⁴-⁸. Surgically assisted rapid palatal expansion is an alternative to achieve effective maxillary expansion in skeletally mature patients¹-³,⁴. However, some authors have reported that this technique has low morbidity¹,³.

Surgical or orthodontic techniques increase maxillary arch perimeter to correct posterior crossbite to prove space for a crowded maxillary and others purposes¹,⁴,⁵,⁷-⁸.

Pre-operative planning includes soft tissue evaluation, and the type of presenting maxillary transverse deficiency and buccal lingual inclination of the posterior teeth⁸. The patient’s age is considered as the fundamental

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basis for distinguishing either the use of rapid maxillary expansion or surgically assisted rapid palatal expansion. This study aims to review available literature, and to present a case of rapid maxillary expansion (RME).

CASE REPORT

The patient is a 38-year-old female with midfacial retrusion and significant transverse deficiency (Figure 2). Lateral cephalometric analysis showed abnormal values. An orthodontic treatment regime was initiated for posterior surgery treatment (Figure 1). The patient was taken to the Hospital after to undergo surgically assisted rapid palatal expansion under general anesthesia using naso-tracheal intubation. A saw was used in the initial procedure to make horizontal bone cuts in both sides through the lateral walls of the maxilla, from the maxillary tuberosity to the piriform fossa region. The medial wall of the maxillary sinus was not included in the cut, and a pterygomaxillary separation was not performed. A diamond disc was used to make a cut through the labial cortex directly between the roots of the maxillary central incisors. A fine osteotome was then used to section between the roots of the central incisors and this was continued along the midpalatal suture to the posterior end of the hard palate without perforating the palatal mucosa (Figure 5). An analysis of the orthodontic expansion required between the central incisors was made before and after the procedure. At this point the expander was activated by turning the expansion screw 10 one-quarter turns (2.5 mm). In this present case, bleeding occurred in the tuber of the maxilla, (due to the proximity of the pterygoid venous plexus), and the nasal cavity, controlled respectively by the use of a fibrin sponge and nasal packing. The surgically assisted rapid palatal expansion procedure continued without further complications (Figure 4). Homeostasis was ensured and sutures put in place.

This work was analyzed and approved by the Ethic Committee of Federal University of Juiz de Fora (protocol number 369/2008).
The choice of using either RME or surgically-assisted RMEs directly related to the closure of sutures and the age of the patient. Surgically-assisted rapid palatal expansion (RPE) is indicated in patients over 16 years old\textsuperscript{1,2,9} with an upper age limit of 25 years\textsuperscript{1-2,9-10}. Some studies have specified the appropriate upper age limit to be 25 years in men, and 20 years for women\textsuperscript{12,11}. This surgery is recommended after the second decade of life\textsuperscript{1-2,12}. Research also suggests that orthognathic maxillary expansion is successful in patients younger than 12, and that corticotomies are essential in patients over 14 years\textsuperscript{1-2,13}.

Many studies have reported the connection between the closure of sutures and the patient’s age, and type of expansion\textsuperscript{14-17}. For example, Latham & Burston\textsuperscript{14} state that, in general, after about 2 or 3 years of age the skull sutures function primarily as sites of bone union, although localized remodeling seems to be a continuing process. In agreement with this assumption, Sicher\textsuperscript{15} declares that the closure of sutures usually starts in the mid-30s at the posterior part of the median palatine suture. Person\textsuperscript{16} added that there is evidence of bony ossification at 17 years old. However, Latham & Burston\textsuperscript{9} report that there is no evidence of synostosis in the same suture by the age of 18 years, Baurind & Korn\textsuperscript{17} reposted that the maxillary sutures close at approximately 14-15 years of age in females and at approximately 15-16 years of age in males. These outcomes suggest that, in spite of the majority of facial sutures appearing to be open on the surface of old skulls, some degree of union may be present in the substance of the suture\textsuperscript{18}.

Although surgically assisted rapid palatal expansion procedures have been reported to have low morbidity, some complications have been described\textsuperscript{1-2}. Several articles have described complications associated with maxillary expansion; for example, significant hemorrhaging and subsequent gingival recession\textsuperscript{1-2,19}. Root resorption has also been reported\textsuperscript{1,2,13,20}. Injuries to the branches of the maxillary nerve, infection, pain, devitalization of the teeth, and altered pulpal blood flow have also been reported\textsuperscript{1-2,13,20}. However, if performed under the correct protocol pulpal blood flow is not affected\textsuperscript{20}. Other complications such as periodontal breakdown\textsuperscript{1,6,21}, sinus infection\textsuperscript{1-23}, alar base flaring\textsuperscript{1,9,22}, relapse, and unilateral expansion\textsuperscript{1,22} have also been reported. In the case of unilateral expansion it is necessary to wait for consolidation to re-evaluate anyesthetic defect and evaluate the possibility of further surgical intervention (Figure 6).
At peroral level, aseptic ulcers, bleeding, and epistaxis have also been described. The risk of fracture is higher in skeletal adults, with an increase in stress at the skull base, particularly at the optic foramen, if the procedure is performed without separation. Other complications include bilateral lingual anesthesia, nasopalatine canal cysts, increased nasal volume, decreased nasal resistance, a decreased craniofacial angle, and increased cervical lordosis angle. A positive effect on the hearing levels in persons with conductive hearing loss has been noted. Some effects noted on the skull include a maxillary slight, an increase in anterior facial height, maxillary and nasal width, buccal bone plate thickness reduction, increased lingual bone plate thickness (mostly in the posterior teeth), and a reduction as a whole of both buccal bone thickness and buccal marginal bone levels of the posterior teeth. No significant effects have been seen in pharyngeal airway dimensions or the hyoid position in adults.

CONCLUSION

Surgically assisted rapid palatal expansion is a widely used procedure for the correction of transverse maxillary deficiency in skeletally mature patients. However, no definitive way exists that combines successful outcomes from various surgical procedures, and that ensures adequate mobilization in combination with the most conservative procedure. Therefore, it is considered necessary that surgeons are fully informed of all possible complications, and that such information is transmitted to prospective patients.

Collaborators

ES URBANO, responsible for the surgical procedure described in the item case report, as well as supervision and collection of references and writing up the paper. KA MELO was responsible for the monitoring of the case, collection of bibliographic references and also has participated in the preparation of the scientific article. ST Costa, was responsible for monitoring the case, collection of bibliographic references, and also has participated in the preparation of the scientific article. RSS STEHLING, responsible for the surgical procedure described in the item case report, as well as supervision and collection of references and writing up the paper.

REFERENCES


